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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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EXAMINER	
WERNER, DAVID N	

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2621	

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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/743,714	KIM ET AL.	
	Examiner	Art Unit	
	David N. Werner	2621	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☐ Responsive to communication(s) filed on _____.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☐ Claim(s) *1-6* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-6* is/are rejected.

7)☒ Claim(s) *1-6* is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☒ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *24 December 2003* is/are: a)☐ accepted or b)☒ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☒ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Priority

1. Receipt is acknowledged of papers submitted under 35 U.S.C. 119(a)-(d), which papers have been placed of record in the file.

Information Disclosure Statement

2. A full translation or concise explanation of the relevance of Korean Publication 2000-55899, cited in the Information Disclosure Statement dated 24 December 2003 is required under 37 C.F.R. 1.98(a)(3). Figure 6(b) of the untranslated document raises a question of relevance to the claimed invention not adequately explained in the translated abstract. See *Semiconductor Energy Laboratory Company Co. v. Samsung Electronics Co.*, 204 F.3d 1368, 1376, 54 USPQ2d 1001, 1007 (Fed. Cir. 2000).

Drawings

3. Figures 2A, 2B, and 4A should be designated by a legend such as --Prior Art-- because only that which is old is illustrated. See MPEP § 608.02(g). Corrected drawings in compliance with 37 CFR 1.121(d) are required in reply to the Office action to avoid abandonment of the application. The replacement sheet(s) should be labeled "Replacement Sheet" in the page header (as per 37 CFR 1.84(c)) so as not to obstruct any portion of the drawing figures. If the examiner does not accept the changes, the

applicant will be notified and informed of any required corrective action in the next Office action. The objection to the drawings will not be held in abeyance.

Specification

4. The abstract of the disclosure is objected to because of numerous minor grammatical errors. Correction is required. See MPEP § 608.01(b).

5. The disclosure is objected to because of the following informalities: there are numerous minor grammatical errors in paragraph [0004]. The following is a suggested corrected paragraph:

> [0004] A motion detector 10 needs a lot of memory accesses and a large memory size in implementing a MPEG-4 algorithm and greatly influences the performance of the MPEG-4 video encoder algorithm. There is a kind of picture that is a P-frame or B-frame, according to the frame direction of motion estimation. However, their motion estimations are similar to each other in that they estimate motion vectors by using memory access of a current macro-block and a reference search area of a previous or next frame. So, only the motion estimation unit for P-frames will be described in this specification. The motion detector 10 for P-frames estimates motion vectors by using the previous frame (t-1) and the current frame (t) as shown in FIG. 2A. In other words, the motion detector 10 finds the most similar location by moving a macro-block of the current frame on a reference search area of a previous frame by pixel. A mean square error

(MSE) method, a sum of absolute difference (SAD) method and a mean absolute difference (MAD) method are proposed as the methods to find the similarity of a current macro-block and a reference search area.

6. The disclosure is objected to because of the following informalities: in paragraph [0005], line 1, the word "an" should be "a", in the last sentence of paragraph [0005], the phrase "use battery long" should be replaced with "use a battery for a long time", in paragraph [0023], line 1, "macro lock" should be "macro block", in paragraph [0027], line 7, "convention" should be "conventional", in paragraph [0029], line 1, "Considering motion estimation method" should be "Considering the motion estimation method", in paragraph [0035] and paragraph [0038], line 2, "$0 \leq j < 16$" should be "$-16 \leq j < 0$" and in line 6, "$16 \leq j < 32$" should be "$0 \leq j < 15$" to comply with the range in paragraph [0034] of [-16, 15].

Appropriate correction is required.

7. 35 U.S.C. 112, first paragraph, requires the specification to be written in "full, clear, concise, and exact terms." The specification is replete with terms that are not clear, concise and exact. The specification should be revised carefully in order to comply with 35 U.S.C. 112, first paragraph. Examples of some unclear, inexact or verbose terms used in the specification are: the percentage sign (%), apparently used to designate a modulo division operation. Although this convention is sometimes used in computer code, it by itself is not considered sufficiently clear in the present context of the specification, drawings, and claims.

Claim Objections

8. Claim 1 is objected to because of the following informality: in the last line of the claim, the phrase "it goes" does not agree in tense with the rest of the claim. It is suggested that the phrase be replaced with the word "going". Appropriate correction is required.

9. Claims 2-4 are objected to because of the following informalities: the percentage sign (%) is apparently used to designate a modulo division operation, but without explanation. Appropriate correction is required.

10. Claims 4 and 5 are objected to because the phrase "buffer addresses is obtained" does not agree in number. Appropriate correction is required.

11. Claim 6 is objected to because the claim ends with a comma. Appropriate correction is required.

Claim Rejections - 35 USC § 112

12. The following is a quotation of the second paragraph of 35 U.S.C. 112:

> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

13. Claims 3-6 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

14. Claim 3 is rejected under 35 U.S.C. 112, second paragraph, as being incomplete for omitting essential structural cooperative relationships of elements, such omission amounting to a gap between the necessary structural connections. See MPEP § 2172.01. The omitted structural cooperative relationships are: the relation to the "three macro blocks" with the rest of the claim. Where are the three macro blocks? Are they stacked vertically? Horizontally? Are these the macroblocks that will be loaded into the buffer?

15. Claim 4 recites the limitation "the 48 x 16 array" in the third line of the claim and the limitation "the 16 x 48 array" in the fourth line of the claim. There is insufficient antecedent basis for these limitations in the claim.

16. Claim 5 recites the limitation "the 32 x 16 array" in the third line of the claim and the limitation "the 16 by 32 array" in the fourth line of the claim. There is insufficient antecedent basis for these limitations in the claim.

17. Claim 6 recites the limitation "the fixed circular buffer" in the third line of the claim. There is insufficient antecedent basis for this limitation in the claim.

Claim Rejections - 35 USC § 103

18. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

19. Claim 1 is rejected under 35 U.S.C. 103(a) as being unpatentable over US Patent 6,108,040 A (Moteki et al.) in view of US Patent 6,282,243 B1 (Kazui et al.) and in view of US Patent 6,380,986 B1 (Minami et al.). Moteki et al. teaches a motion vector detection system that detects motion on a partial area in a frame. Regarding step (a) of the method of claim 1, in Moteki et al., motion vector calculation is only performed on a pre-determined number of input fields in a frame (column 9, lines 24-26). Regarding step (c), Moteki et al. performs motion vector retrieval in a search window in a frame (column 6, lines 23-25). Regarding steps (d) and (e), a control checks if the search window has ended. If it has ended, then motion vector detection is completed. Otherwise, the method goes back to a previous step (column 6, lines 25-33). However, Moteki et al. does not explicitly teach counting horizontal or vertical blocks.

Kazui et al. teaches an interframe video coder and decoder. Regarding step (c), in one embodiment of Kazui et al., a calculation controller counts blocks. The current vertical position is the integer division M/N, where M is a current count value, and N is the number of blocks in the frame. Regarding step (d), the current horizontal position is M mod N, the modulo value of M with respect to N, or the remainder of M/N (column 13, lines 6-39).

Moteki et al. discloses the majority of the claimed invention except for counting horizontal and vertical blocks in a search window. Kazui et al. teaches that it was known to count blocks to determine a current block position. Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to determine block position by counting blocks in a video encoder as taught by Kazui et

al., since Kazui et al. teaches that such a modification would reduce an error in calculating the direction of a motion vector for a current block versus only examining horizontal and vertical motion vector components alone (column 13, lines 40-50).

However, Moteki et al. does not teach step (b), loading a column of frame data into an internal memory. Minami et al. discloses a method for obtaining a motion vector by matching a target block and a set of blocks having the same size as the template. Regarding step (b), figure 17 of Minami et al. shows search area 29 for block 27 and search area 30 for block 28. Although search area 29 and search area 30 appear to be shifted with respect to each other in the vertical direction, that is merely a technical limitation of the drawing, and they are actually coincident in the vertical direction (column 5, lines 1-4). Detection of motion vectors in Minami et al. is performed in a left-to-right manner (column 4, lines 47-48). To search the motion vector for block 28 after searching for the motion vector for block 27, the whole of area 30 need not be loaded into an internal memory in a motion vector search apparatus, since most of it is already loaded as part of area 29. Then, only newly searched column 31 is transferred into the memory (column 4, lines 48-67).

Moteki et al. in combination with Kazui et al. disclose the claimed invention except for moving a frame column into an internal memory. Minami et al. teaches that it was known to load pixels in a memory by column. Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to store pixels in a memory in a periodic fashion as taught by Minami et al., since Minami et al. states in column 4, lines 61-67 that such a modification would facilitate higher-

speed data transfer by avoiding slow data transfers from an external memory into an internal memory.

20. Claims 2 and 3 are rejected under 35 U.S.C. 103(a) as being unpatentable over Moteki et al., Kazui et al., and Minami et al. as applied to claim 1 above, and further in view of US Patent Application Publication 2004/0141554 A1 (Phong et al.). Although Minami et al. discloses selectively loading block data if a search has not been completed, it does not disclose modulo addressing. Phong et al. discloses a cache memory for a motion estimation system. Regarding claim 2, figure 2c and figure 3c of Phong et al. each show a "thick mode" cache in which one sub-cache may be stacked on top of another sub-cache vertically (paragraph [0048]) to allow for a vertically-oriented search window, in which searching for a motion vector for a macroblock leads to a position above or below the macroblocks stored in one cache (paragraph [0023]). The pointers to the united cache increment in a modulo manner (paragraph [0053]).

Moteki et al., Kazui et al., and Minami et al. disclose the claimed invention except for modulo addressing of a memory. Phong et al. teaches that it was known to address a memory with modulo arithmetic. Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to use the modulo addressing system of Phong et al. for the memory of Minami et al., since Phong et al. states in paragraph [0028] that such a modification would enable a flexible search area without increasing the number of memory accesses.

Regarding claim 3, Phong et al. discloses a system with a variety of cache sizes, such as 9 x 4 macroblocks, 6 x 3 macroblocks, 10 x 5 macroblocks, and 7 x 4 macroblocks (paragraphs [0047], [0049]), whereas it seems that in claim 3, the memory is limited to 3 x 4 macroblocks. However, it would have been obvious for one having ordinary skill in the art at the time the invention was made to modify Phong et al. to produce a cache size of 3 x 4 macroblocks, since such a modification would have involved a mere change in the size of a component, which has been held as within the level of ordinary skill in the art. See *In re Rose*, 105 USPQ 237 (CCPA 1955).

21. Claim 6 is rejected under 35 U.S.C. 103(a) as being unpatentable over Moteki et al., Kazui et al., and Minami et al. as applied to claim 1 above, and further in view of US Patent 6,813,351 B1 (Auyeung et al.) Moteki et al., Kazui et al., and Minami et al. do not teach motion estimation in a small range and a large range. Auyeung et al. teaches a system that performs motion vector estimation on two concentric search windows. Regarding claim 6, in one embodiment of Auyeung et al., as illustrated in figure 12, motion vectors are searched in a coarse window and a fine window (column 11, lines 51-53). Since determining motion vectors is computationally complex, it is often desirable to only search for motion vectors in a portion of a previous image (column 4, lines 15-34). Then, in a fine search window, difference measures are calculated for every pixel block (column 5, lines 13-18), and only some pixel blocks in the coarse search window are searched (column 11, lines 54-61). The motion vector is determined

at the block in which the difference between the block in a current frame and the block in a previous frame is minimized (column 5, lines 16-17).

Moteki et al., Kazui et al., and Minami et al. disclose the claimed invention except for performing a search in two search ranges. Auyeung et al. teaches that it was known to search for motion vectors in a fine search window and a coarse search window. Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to search for motion vectors in a small search window and a large search window as taught by Auyeung et al., since Auyeung et al. states in column 5, lines 6-10 that such a modification would reduce computational overhead (time and memory space) by not searching every single pixel block in a frame.

In the present invention, a small search range of [-8, 7] and a large search range of [-16, 15] are used, presumably in both the x and y directions, and in Auyeung et al., a small search range of (-21, 21) is used in the x direction, a small search range of (-12, 12) is used in the y direction, a large search range of (-63, 63) is used in the x direction, and a large search range of (-31, 31) is used in the y direction. However, it would have been obvious for one having ordinary skill in the art at the time the invention was made to modify Auyeung et al. to search in the search ranges given in claim 6, since such a modification would have involved a mere change in the size of a component, which has held as within the level of ordinary skill in the art. See *In re Rose*, 105 USPQ 237 (CCPA 1955).

Allowable Subject Matter

22. Claims 4-5 would be allowable if rewritten to overcome the objections on formalities and the rejection(s) under 35 U.S.C. 112, 2nd paragraph, set forth in this Office action and to include all of the limitations of the base claim and any intervening claims.

23. The following is a statement of reasons for the indication of allowable subject matter: claims 4-5 are directed to entering macroblock data into an adjustable circular buffer based on a search range. Phong et al., the closest prior art, does not have this feature.

Conclusion

24. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. US Patent 5,357,287 A (Koo et al.) teaches a system for motion estimation searching within a given search area. US Patent 5,696,698 A (Herluison et al.) teaches a cache memory for a video compression circuit, divided into four half-macroblock segments. US Patent 5,706,059 A (Ran et al.) teaches a system for hierarchically searching for motion vectors with a three-part memory. US Patent 6,141,448 A (Khansari et al.) teaches modulo summation for generating a motion vector field in a search range. US Patent 6,148,034 A (Lipovski) teaches a system that performs a [-8,7] sum-squared error calculation to determine motion vectors. US Patent 6,473,460 B1 (Topper) teaches a system that performs motion vector searching on overlapping blocks. US Patent Application Publication 2002/0031179 A1 (Rovati et al.)

teaches an image processing circuit in which the displacement components of a macroblock in a motion vector are stored as a pair of addresses in two memories. US Patent Application Publication 2004/0013197 A1 (Park) teaches a system that decimates macroblocks before performing motion vector searches in windows of various sizes.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to David N. Werner whose telephone number is (571) 272-9662. The examiner can normally be reached on Monday-Friday from 8:30 AM - 5:00 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Mehrdad Dastouri can be reached on (571) 272-7418. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

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